

IEEE Instrumentation and Measurement Society Short Course Program



A. Measurement Theory



B. Calibration and quality assurance



C. Instrumentation module



D. Practical training

The IEEE I&MS is working on a 4-module short course program on Instrumentation and Measurement with the aim to give people a framework that they can apply to all types of instrumentation and measurement. It provides young professionals, graduate students and practicing technical staff increased capabilities in instrumentation, measurement and calibrations skills.

The I&MS is actively seeking to recruit experienced tutors to support the development and delivery of first module on Measurement Theory in the Short Course program.

Nominating and Appointing IEEE IMS Tutors

The committee shall evaluate the experience, values and merits of each nominee based on qualitative and quantitative evidence. Self-nominations are permitted. The nomination package should include:

1. Complete CV including publications and teaching experience, with particular focus on online lecture delivery
2. Statement of interest from the candidate expressing their willingness to serve as an IMS Short Course Tutor and how they plan to complete their respective duties according to the Guidelines
3. A short lesson resume (5 min), recorded according to the quality and format standards described in the Guidelines

All nominations should be submitted by May 30. The appointment will be made by June 15 and the lesson package, as described below must be delivered by July 15.

Duties of IEEE IMS Tutors

- Develop one or more lessons included in the topic list. Each lesson includes:
 - A 20-minute video lecture over Powerpoint slides;
 - Working examples and/or workpapers, either totally or partially solved by the Tutor;
 - An Assessment Quiz.
- Provide an e-mail address to be used as primary communication channel with the students asking for clarifications.
- Commit to answer to student's requests in a timely manner.
- Provide a list of references for each lesson.

Topic list

1. **Measurement uncertainty:** Risk and cost, direct and indirect measurements, probabilistic uncertainty models, GUM
2. **Basic statistics for probabilistic uncertainty model 1:** mean, standard deviation and variance, median, mode, pdfs examples, degrees of freedom, percentiles, regression
3. **Basic statistics for probabilistic uncertainty model 2:** repeatability, reproducibility, confidence intervals, correlation, generating functions, convolution, central limit theorem, software tools
4. **Expanded Uncertainty Type A:** experimental estimates of uncertainty, standard deviation, normal distribution and probabilities, confidence intervals, prediction intervals, degrees of freedom
5. **Expanded Uncertainty Type B:** theoretical estimates of uncertainty: sources, assumptions, constraints, other sources of data/physical models, non-normal distributions.
6. **Total Uncertainty:** propagation of uncertainty, combining uncertainties, effective degrees of freedom, Welch-Satterthwaite formula, sums of random variables, convolution, method of moments distribution, sums of central moments, central limit theorem.
7. **Tools to determine total uncertainty:** Monte Carlo, numerical toolboxes from TC-32, GUM-tree, Excel
8. **Design of experiments:** Optimal experiments with low uncertainty, calibration issues, excitation signal design, noise and anti-aliasing filters, frequency band selection methods.

GUIDELINES

GUIDELINES | LESSON PLAN

Lecture

The lecture should consist of:

- slides of the lesson
- recorded video (see Guidelines | Video lessons for more details)
- accompanying material (in dependence on the lesson topic):
 - worked out exercises (suggested 1-5 exercises)
 - proposed exercises partially or totally to be solved, solutions given (suggested 5-10 exercises)
 - quiz with multiple choice (1 correct answer out of 4 - suggested - 10 questions)
- laboratory section, if relevant.

Exercises and material for practicing

The lesson shall be completed with:

- Solved exercises
- Partially-solved exercises
- Proposed exercises and solutions

Assessment

Students interested to earn CEUs/PDHs have to pass a test based on an assessment quiz .

The teacher shall include a database, in .doc format, of a pool of 20 questions with multiple choice (4 possible answers) and 10 calculation questions with an open answer. Correct solutions must also be included.

The Assessment Quiz proposed to the students will consist of 7 multiple choice questions and 3 calculation questions randomly picked out from the database.

GUIDELINES | VIDEO LESSONS

This section provides the essential guidelines for the realization of video lessons.

Making a video lesson involves major changes to the traditional teaching method: the teacher must identify a new way of exposing, synthesizing and presenting notions to virtual students, triggering a critical and reflective learning process.

In traditional (face to face) teaching, teachers and students are co-present and interact, through a bi-directional communication. Teaching through video involves no co-presence and the communication is unidirectional.

Unidirectional communication, while not allowing the teacher to take advantage of an immediate feedback from the interlocutor, is particularly effective because of its being planned in advance, free of repetitions, structured and consequential, objective and synthetic, very appropriate in the vocabulary, and full of information.

A fundamental strength of video communication consists in the possibility of simultaneously presenting different models: spoken language, written texts and images.

Production of the video lessons

All the video lessons, which are part of the course, must have the same duration, about 20-30 min long.

The lessons shall be filmed in a television studio (if available in the home university), using a white background. The teacher can seat on a stool or stand up.

Whenever possible use two cameras:

- › one camera takes a close shot of the teacher, and it's used to open and close the lesson
- › one camera takes a wide shot of the teacher, providing the empty space used for the different contributions (graphics, videos...).

Filming

If a television studio is not available in the home university, the lesson can be auto-recorded by the teacher.

The teacher has to provide a video of him/herself for the entire lesson.

The following is a brief set of simple **instructions for auto-recording** aimed to maximize the quality of auto-recorded videos.

- The required frame size is 1920x1080 (FullHD), 25 or 30 frames per second (fps).
- Use the recording device in HORIZONTAL position.
- Place the recording device in a stable and fixed position. Avoid touching and moving it during the recording.
- After you start the recording wait a couple of second before starting to talk. Similarly, look at the camera for a couple of seconds after you stop talking before stopping the recording.
- Choose a silent spot to record your video to avoid background noises (i.e., traffic noise coming from open windows, people talking in the same room...).

- Choose a uniform background and avoid windows and other light sources behind the speaker.

Recording tip: since the camera of your device represents your audience's eyes, try to look at it as much as possible. The parts of the video in which you want slides and images to be added to your speech are, of course, fine even if you're not looking at the camera.

Post-processing

The teacher has to provide helpful indications to synchronize the speech and the support material. It must be sent to the post-processing staff that reviews it and can eventually suggest modifications in the style, to maximize the effectiveness of the exposition.

All the support material must be sent to the post-processing staff along with the synchronizing instructions.

Support material

- PowerPoint presentation of the lesson; the first slide is provided by the Society and shall not be changed, but only completed with required information. The images, video and plots included in the presentation shall be numbered and sent as separate high-resolution files, with the same name, according the requirements listed below.
- Short texts that highlight the salient points of the speech; they can be single keywords, phrases or lists of terms and concepts helpful for understanding the exposition.
- Formulas, charts and diagrams; they must be provided in PowerPoint. The file must include the animations to allow the post-processing staff to adapt the graphics to the video. Symbols used in the presentation shall comply with the guidelines, which will be provided by the Society.
- Images and videos; in order to be used they must have been produced by the teacher or, when produced by third parties, the teacher must be authorized to use them.

Production times

The support material for each sub-unit must be sent, by email or wetransfer or by a link to Google Drive, not less than 15 working days before the scheduled registration date to post-processing staff, that ensures the correct working times for the verification of compliance with the required characteristics and the graphics processing.

Operative indications

Clothing

It is required not to wear light colors (white, beige, ...), in order to increase the contrast with the white background of the set.

The choice of clothing, more or less formal, is left to the teacher.

Images

The minimum size required to show images full-screen is 1920x1080 px, 96dpi.

Accepted formats: jpg / tif / png / bmp.

Video

Videos have to be Full HD 1080p (1920x1080 25fps) to be shown full-screen.

Accepted formats: mp4, mov, avi.

Additional material

The video and PowerPoint presentation shall be completed with:

- A teacher short CV
- A photo of the teacher
- A summary of the lesson
- A list of keywords (minimum 3 up to 6)
- An e-mail address
- A list of references for the lesson
- A Consent and Release form, signed by the teacher of the lesson. The teacher of the video is defined as the speaker of the material within the video (not others who may have contributed to the development of the topic). Lesson will not be published without a signed Consent and Release form.
- A statement of commitment to fulfill the Tutor duties as listed above.